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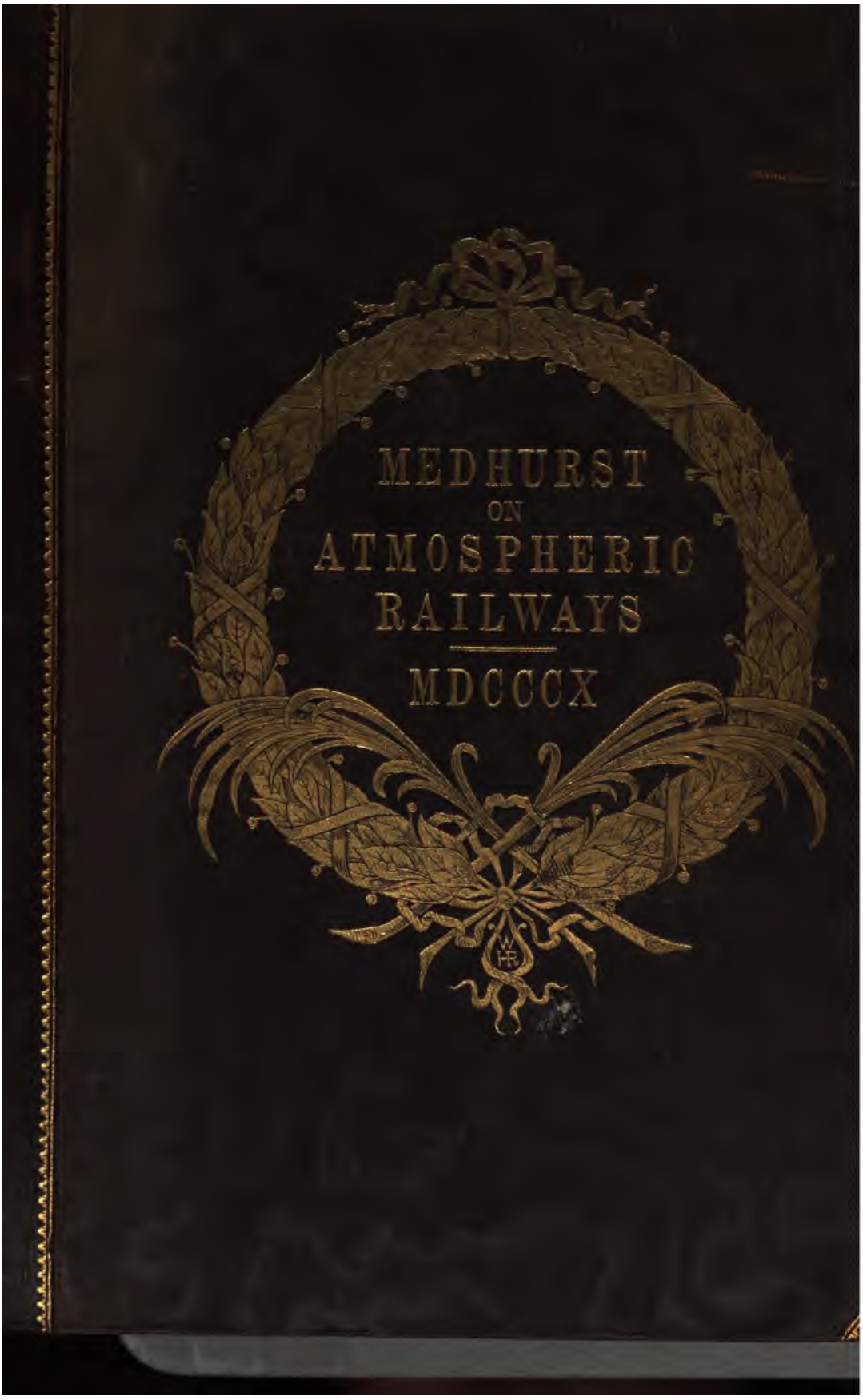
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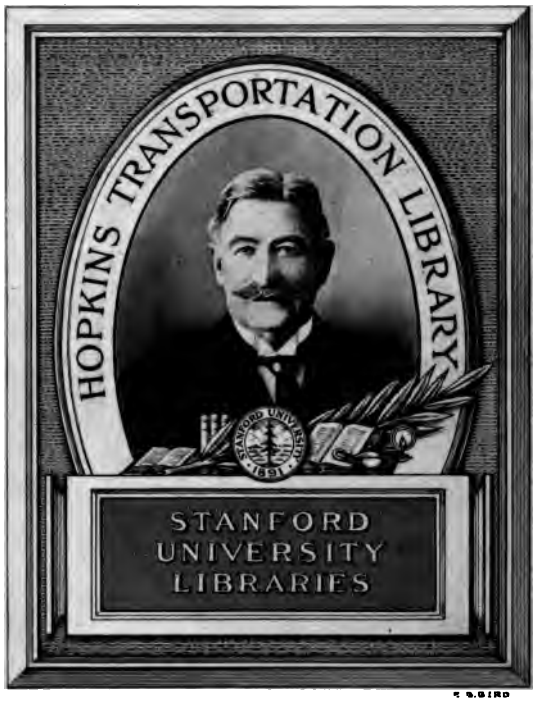

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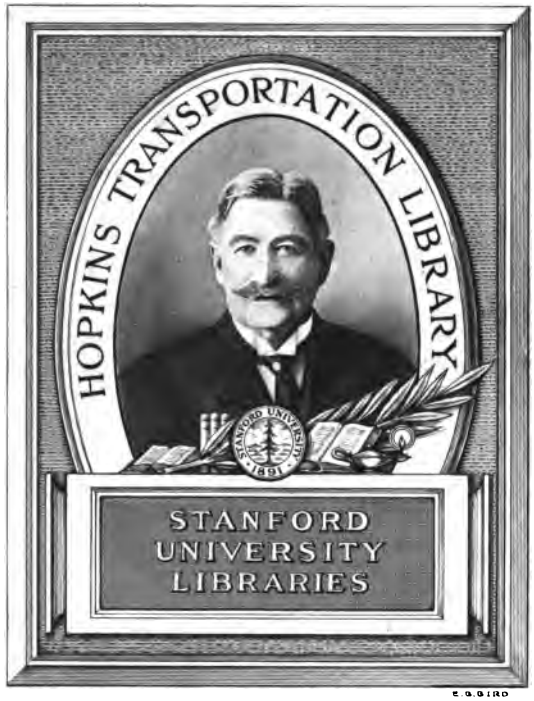


Note. At first sight this would appear to be a ~~reproduction~~ of a private collector. But it is just possible that it was a public issue, as I have seen another copy exactly similar binding and all. To whom do the [redacted] cover refer?
(This [redacted] part of the Samuda Collection).

TF692
M49

Contents.

A New Method of conveying Letters and Goods.... by Act. 1810. (11 pp).

Calculations and Remarks 1812 (18 + [1] pp).

On the ----- Aeolian Engine no date (23 pp.).

A New System of Inland Conveyance 1827. (34 pp. 5 plates). Followed by a 4 pp. catalogue of weighing machines made by Medhurst, with a folding plate illustrating the same; and 2 pp describing a patent canal lock and lock gate.

A

NEW METHOD

OF CONVEYING.

LETTERS AND GOOI

WITH GREAT CERTAINTY AND RAPIDITY BY

Air.

BY

G. MEDHURST,

INVENTOR, PATENTEE, AND PROPRIETOR,

No. 1, DENMARK STREET, SOHO.

LONDON:

PRINTED BY D. N. SHURY, BERWICK STREET, SOH

1810.

the second principle is a theorem to investigate the difference in the resistance between tubes of different dimentions. and is also capable of a demonstration

that the resistance will be as the same proportion that the velocities became to the area,

The third step is to prove the difference of the resistance in different degrees of velocity. which is here taken to be as the square of the velocity for the number of particles impelled will be as the velocity and the resistance of each will

His Majesty's Letters Patent

ARE GRANTED TO

GEORGE MEDHURST,

No. 1, DENMARK STREET, SOHO, LONDON,

FOR HIS INVENTION OF

Machinery

FOR THE RAPID CONVEYANCE OF

GOODS AND PASSENGERS

BY

AIR.

by a the velocity

The fourth proposition is to effect

the inertia of that body of air a

in the Canal and is founded upon the
well known experiments upon falling
bodies and the theory of their accelerations
and is in proportion to a ~~falling~~ body falling
~~[illegible]~~ in the ~~[illegible]~~ time and
in a glass of such
a like missive compound

The first preparation of experimental
and is the force required to move a
Carriage upon another ~~[illegible]~~ or a
common Road upon level
and upon a rising ground
more is plate greater than is made
and by common experiment over a stirrup
part of the weight on level ground and
double of that upon inclination of
one in thirty

A NEW METHOD

OF

CONVEYING LETTERS,

&c. &c.

THE extraordinary strength, levity, and elasticity of Air renders it capable of very high degrees of velocity by mechanical means, far greater than can be given to any other body passing through the atmosphere.

It may easily be verified by experiment, that air forced through a tube with the small pressure of 6 ounces per

The next proposition is purely experi
and ascertains the resistance of the ai
Air to the Carriage moving through
and is taken from the experiments of

square inch, will pass with a velocity of 150 feet in a second, which is something more than 100 miles per hour.

And in greater degrees of velocity the pressure required will nearly agree with the square of the velocity; so that if the pressure is increased to 40lb. per square inch, the air will be impelled 1500 feet in a second, which, if continued, would amount to above 1000 miles per hour.

These properties of air afford the means of conveying letters, and other light articles, to great distances with a celerity at least ten times greater than the most rapid conveyance that has ever been put in practice.

If a light and hollow vessel is so formed as to fill the area of a tube, and to move freely through it, carrying papers not exceeding three ounces in weight, it will be driven

Smeaton and others

through the tube with the velocity of 150 feet in a second by the pressure of 9 ounces per square inch.

And therefore a tube of uniform dimensions being laid upon or under ground, from one place to another, without any sudden curvature, will form the means of conveying packets of letters with the velocity of 100 miles per hour, by forcing the air through the tube with a pressure of three ounces per square inch for every ounce weight in motion.

And if there are two tubes of the same dimensions leading from one place to another. Packets of letters may be conveyed each way, at the same time, without a possibility of their clashing against each other; and many packets may be conveyed the same way in the same tube, which can never approach each other, but will all proceed with

Which are not a necessary appendage the interior Barrage, that is not to be carry weight for it would wear upon wooden shoes upon a polished

an uniform motion and equal rapidity to their destination, where the tube entering an air-tight room the packets will be deposited, and may be delivered or forwarded to the next stage through their proper tubes commencing in the same room; and their progress can never be impeded by the seasons or the elements.

The expence of preparing and laying down tubes for this purpose will be from 100l. to 1000l. per mile, according to their dimensions, and the permanency of the works.

And the force necessary to impel a weight of three ounces through a tube 150 feet in a second, will be equal to that of raising a weight of 84 pounds one foot in a second, which is one third greater than the ordinary labour of a man.

with greater facility than being mounted with Wheels and the Road would not suffer.

THIS principle is capable of being so far extended as to convey portable goods of great weight and magnitude through the country with a celerity at least ten times greater than can be effected by canal or waggon, and at less expence than either.

If a tube or tunnel is built of brick, stone, timber, or iron, of twelve feet area, upon or under ground from one place to another in a line as straight as the surface of the country will permit; and a four-wheeled carriage is fitted to run within it upon an iron road, so that no considerable quantity of air can escape between the sides, such a carriage loaded with one ton weight of goods, and weighing itself ten hundred, will be impelled upon level ground with

The Wheel that is designed to lift up covering plate of the Canal or Tube be more convenient if it was on the bung. accessible and may perhaps be

the velocity of 20 miles per hour by a pressure of air against it of 220lb. which is two ounces per square inch.

This force is equal to the power of eighteen horses, and will be created by steam, with one bushel of coal per hour, which, at 20d. per bushel, will amount to 1d. per ton per mile conveyance.

If the ground rises above the horizon in an angle of 3 degrees, which is 1 foot in 19; the same weight and velocity will require a double pressure and expence of power, and in all intermediate degrees of inclination the necessary impulse will follow nearly in the same proportions; and in all degrees of velocity the impulse upon the moving body must be as the resistance and velocity combined; and the impulse upon the column of air will be as the square of the velocity.

This effect will be produced by a steam engine, at the mouth of the tunnel, impelling the air through it, without the labour and expence of horses, giving a velocity far beyond the power of horses, which may be continued from stage to stage, in all directions, and to very great distances by the same engine, not only on level ground, but also over great elevations, with a steady, uniform, and uninterrupted course, without any attendance or conductor in its progress, or the least danger of accidents from the rapidity of the motion, and may be continued through all seasons of the year, unaffected by frost, snow, drought, or floods, which are causes that prevent the conveyance of goods by canal upon an average one sixth part of the year.

FINIS.

SHURY, PRINTER, BERWICK STREET, SOHO, LONDON.

CALCULATIONS

AND

REMARKS,

TENDING TO PROVE THE PRACTICABILITY,

EFFECTS AND ADVANTAGES

OF

A PLAN

FOR THE

RAPID CONVEYANCE

OF

GOODS AND PASSENGERS

UPON AN IRON ROAD

Through a Tube of 30 *Feet in Area,*

BY THE

POWER AND VELOCITY

OF

AIR.

By G. MEDHURST,

Inventor and Patentee,

DENMARK STREET, SOHO, LONDON.

London:

PRINTED BY D. N. SHURY, BERWICK STREET, SOHO.

1812.

CALCULATIONS, &c.

THE great velocity of Air through an aperture, or tube, has hitherto been but little noticed, although the effect, from the extreme lightness of that body, and the well-known laws of motion, must have been manifest by observation or the least reflection upon the subject.

It may be made manifest by an experiment with a pair of common bellows, by comparing the quantity of Air that escapes in a given time, with the aperture through which it passes, by which it will appear, that Air may be driven with a velocity of 200 feet in a second by the pressure of the hand. And if an experiment is made with due precision by an instrument contrived for that purpose, it may be proved that Air will pass through a tube with a velocity of 200 feet in a second, by a pressure of 134lb. per square foot,

passengers, and of strength and capacity for large and heavy goods. The tube must be made air tight, and of the same form and dimensions throughout, having a pair of cast iron wheel-tracks securely laid all along the bottom, for the wheels of the carriage to run upon. And the carriage must be nearly of the size and form of the tube, so as to prevent any considerable quantity of Air from passing by it.

If the Air is forced into the mouth of the tube behind the carriage, by an engine of sufficient power, it will be driven forward by the pressure of the Air against it; and as the Air will be continually driven into the tube, the pressure against the carriage, and consequently its motion, will be continually maintained through the whole length.

The interior dimensions of the tube to answer the purpose of internal conveyance effectually, should be 6 feet high, and 5 wide, 30 feet in area. This will admit a carriage sufficiently large for passengers, and in general for all portable goods.

is 209 ounces per square foot; consequently, if the road rises above the horizontal line one foot in twenty, it will require a double force; and all intermediate degrees of inclination will require a proportional increase of force; and therefore, if the road rises 100 feet in a mile, the impelling power upon the carriage must be equal to 536lb. which, in a tube of 30 feet area, will be 286 ounces per square foot.

If the tube is six feet high within side, it will admit of the carriage wheels to be 5 feet 10 inches in diameter, which must turn four times round in a second to go fifty miles per hour; and if they are truly circular, and accurately fitted upon their axis, and the iron road clean, even, and regular, the motion of the carriage, without the aid of springs, will be nearly as smooth and steady as a boat upon a canal, and consequently a less degree of strength and weight will be required in the carriage than what is necessary for carriages that run upon a common road.

The force necessary to drive the Air 73 feet in a second, or 50 miles an hour, being 250 ounces

must be equal to 260 horses upon each tube, equal to the consumption of seventeen bushels of coals per hour, which will amount to something more than a halfpenny per ton per mile, for the greater the quantity of goods conveyed, the less will be the proportional expense of conveyance.

And under these circumstances, the greatest impulse upon the carriage will be 26lb. per square foot, and the greatest density of the impelling Air within the tube will be to the atmosphere, as 2186 is to 2160, which is one eighty-third part greater, and is too small a difference to be felt with any inconvenience by persons within the tube.

All horizontal turnings of the road should be circular, that equal degrees of curvature may be made in equal distances.

And a carriage moving from a straight line through the arch of a circle, will leave the arch and proceed in a straight line that makes an angle with the first, equal to the angle sustained by the arch, and double the angle made by the chord of the arch and the first line of motion.

to load and unload at any required distance with very little loss of time.

In many cases it will be practicable upon the same principle to form a tube so as to leave a continual communication between the inside and the outside of it, without suffering any part of the impelling air to escape, and by this means to impel a carriage along upon an iron road in the open air with equal velocity, and in a great degree possessing the same advantages as in passing withinside of the tube, with the additional satisfaction to passengers of being unconfined, and in view of the country.

Such a tube made of iron of twelve inches in diameter, having a moving box or piston to fit and move freely within side, and made to communicate by a particular contrivance through the side of the tube to the carriage without, it will be impelled with the same force and velocity as before described by the internal Air, when it acquires, by the power of the engine, the density of 3*lb.* 6*oz.* per square inch.

And the quantity of Air necessary to obtain this

advantage, for the same power that in the first case is requisite to impel the Air through the tube, must in the second be applied to impel the carriage through the atmosphere. And, upon the whole, the quantity of impelling power in this case, and, consequently, the expense of conveyance must be greater, and the difficulty of execution will be greater, and the regularity in point of time will be subject to greater variation; but at the same time this mode will admit of a very great advantage in convenience and accommodation.

Although the Air is not the first cause of the motion, in either case, as it must itself be forced through the tube by the power of the engine, but is the intermediate agent by which the carriage receives its motions, no other body in nature or any mechanical contrivance, is capable of being so advantageously applied to the purpose; as from its lightness, it is capable of such velocity by so small a force, and as it is always present in all places for the application, and is never impaired or rendered unfit for the performance; and because it will follow the moving body in all di-

The principal advantages attending the mode of conveyance will be,

First. Passengers may be conveyed to the greatest distance through the country with ease and great safety at the rate of a mile in a minute, or fifty miles per hour upon an average, and at the expense of one farthing per mile.

Second. All kind of portable goods, merchandize, manufacture, and produce, will be conveyed with the same velocity, at the expense of one penny per ton per mile conveyance.

Third. The conveyance cannot be obstructed or impeded by frosts, snow, floods, or drought, nor endangered by robbery, by darkness, or the weather.

Fourth. No locks or other obstructions will be required in the passage, for the force of the impelling Air will be sufficient to gain an ascent of 100 feet in a mile continually.

ON THE

Properties, Power, & Application

OF THE

Aeolian Engine,

With a Plan and Particulars for carrying it into Execution, upon a Scale that will embrace all the principal Objects to which it can be applied with full effect.

BY G. MEDHURST,

ENGINEER,

Inventor, Patentee, and Proprietor,

DENMARK STREET,

SOHO.

LONDON:

Printed for the Proprietor by William Burton, 82, Fetter Lane.

Price Two Shillings and Sixpence.

THE

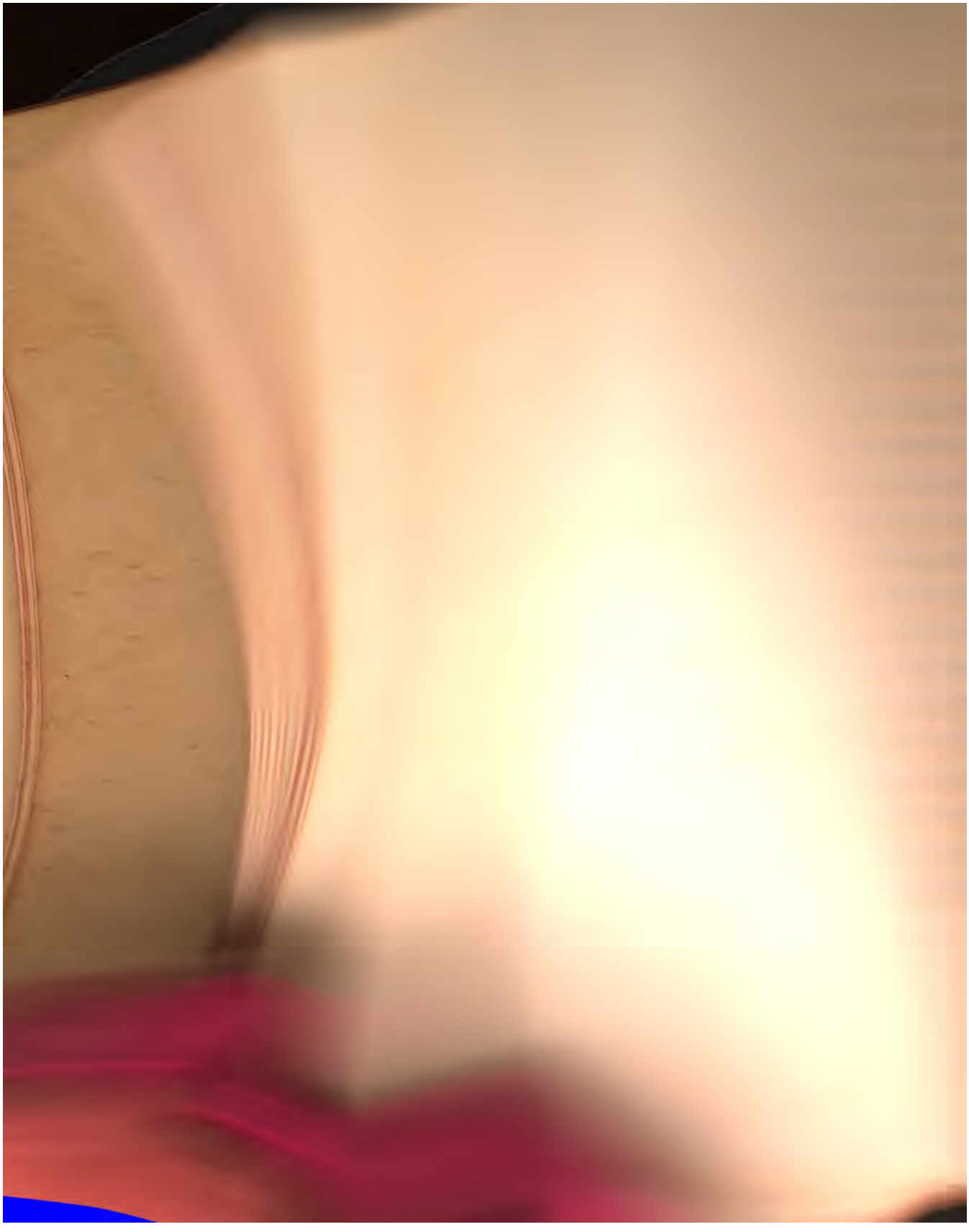
ÆOLIAN ENGINE

IS justly esteemed to be the most comprehensive and important invention of the present age, being an universal, perpetual, and regular mechanical agent, capable of being magnified to an extent of power far beyond the bounds of any engine whatever hitherto known, of being applicable to its purpose in all situations, in town or country, and of being effectually employed as a first mover of all kinds of machinery, either fixed or in loco-motion, that, at

a stream of water, without being confined to situation, or affected by drought, frost, or floods.

It is a power generated and supported by the wind only, which, from its inconstancy, has hitherto been applied to very few mechanical purposes, and those few very imperfect, navigation only excepted. It is by this invention that the power of the wind will be made manageable, regular, and perpetual in machinery, capable of maintaining any power required in its full force, although the wind should cease to blow for many days together.

It will be comprehended in the smallest space of any other power existing, will be applicable to its purpose by very simple machinery, and is the lightest of all substances. From these properties it will be capable of being applied to all kinds of moveable machinery, either upon the road for the convey-



The PRINCIPLE of this invention is to employ the wind as a first mover, to condense the common air of the atmosphere into a vessel of sufficient strength and capacity; which condensed air is then applied to produce the regular power and motion upon proper machinery adapted to the required purpose.

For this part of the contrivance the machinery will be so constructed that the smallest impulse upon the sails will not be lost, and the whole power, afforded by the strongest wind, will be collected without waste, whatever may be the density and resistance of the air in the magazine, which will not be permitted to encrease beyond a certain degree.

It appears from the experiment and calculation made in the investigation of the subject, that a vessel of sixteen cubic feet contents, charged with sixteen atmospheres, or sixteen times the natural quantity of air, is equal to the work of one horse for one hour,

globe of three feet diameter, charged to the same degree, will drive a carriage, carrying one person, ten miles, with the same allowance as before.

It is also experimentally proved that the smallest lead pipe that is made for common use is sufficiently strong to conduct the air under the highest degree of condensation required, which affords an adequate means of conducting the condensed air to great distances from the main reservoir or magazine, either upon the roads or for the business of agriculture.

The value of the invention to the proprietors, and the advantage the public will receive, by the facility and cheapness of conveyance only, may, in some measure, be appreciated by the following observations of the immense sums of money that have been expended in the formation of canals and iron rail-ways in various parts of the kingdom, within these few

and easy conveyance to the trade and manufactories of the kingdom.

But still this excellent mode of conveyanec which has gained such an ascendancy in the minds of mankind, will fall very short of the perfection to be obtained by the Æolian principle applied to this purpose.

The average of the expence of forming canals may be stated very near the truth at 3500*l.* per mile; but the establishment of the Æolian conveyance upon the road will not exceed 500*l.* per mile; the cheapness of the carriage of goods may, in all cases, be equalled to the carriage by canals with equal advantage to the proprietors, and the expedition doubled. It will possess advantages still superior in the conveyance of passengers, and may be extended for all purposes to great distances, in all collateral branches upon the es-

ame weight backwards, in thirteen hours and wenty minutes.

An engine of this power, properly establish-ed upon the road for the conveyance of goods, and in full employ with 4*d*. per ton, per mile. would produce 4380*l*. per annum, and with 1*s*. 4*d*. per ton, per mile, would produce 17,520*l*. per annum.

It appears also, that four horses in a stage coach will convey twelve passengers, viz. six within and six without, seven miles in an hour, together with ten hundred weight of luggage, the charge of which is, in the neighbourhood of London, 1*l*. 5*s*.

An engine of the power of ten horses, adapted to the conveyance of passengers and in full employ at these prices, would produce 72*l*. in twenty-four hours, which amounts to 26,280*l*. per annum.

The late attempt to drive a carriage by rong steam, though imperfect in itself, af-)rds an abundant proof of the practicability f performing the same thing by condensed ir; as this principle is entirely free from all hose imperfections found in the application)f steam to the purpose, namely, the cum-)rous machinery, the weight of the furnace, uel, and water, the constant attendance of :he fire, with the heat, smoke, and expence of fuel, all of which are unnecessary upon the Æolian principle; moreover the condensed air may be conducted to great distances by tubes, so as to renew the charge of the magazine in motion every half hour, if required, and will continue its force unabated when it is not in action, which steam will not do; it is also ready the instant required, and may be magnified to a degree of strength, by artificial means, approaching to infinity.

PROPOSALS

For carrying into Execution the Invention of the

ÆOLIAN ENGINE,

THE PATENTS

for which are in the Hands of

Mr. GEORGE MEDHURST,

DENMARK STREET, SOHO.

THERE are two patents taken for the Æolian Engine, the first relates to the application of it to all fixed machinery, suc as mills, manufactories, and hydraulics, and is intended as a substitute for the steam engine.

The second patent relates to the application of it to all machinery in loco-motion, such as the driving all kinds of carriages upon the road, for conveying goods and passengers without the aid of horses, and also to effect the

profit arising from the concern for each share, as is therein expressed, upon his fulfilling the remainder of the subscription, as expressed in the following article.

ARTICLE II.

The money deposited shall be appropiated to the building a complete and efficient engine, upon a small scale, to demonstrate to the public the practicability of the inventoin in all fixed machinery as expressed in the first patent, and five of the subscribers shall be chosen as directors to conduct the application of the money to the purpose intended.

ARTICLE III.

As soon as the first ten deposits are made, amounting to 100*l.* the building of the engine shall commence, by and under the direction of the inventor, who shall receive the money

ARTICLE V.

As soon as the carriage is completely finished, and the engine applied with success, both in fixed and moveable machinery, the second division of the interest and profit arising from the invention shall be offered to sale, subdivided into fifty equal shares, at the price of 1000*l.* each share, or any greater sum that, in this advanced state of the business, shall appear eligible to the directors. Each subscriber to pay 100*l.* at the time of subscribing, and the remainder by instalments of 100*l.* each, as called for by the directors. The money raised by the sale of the shares of the second division shall be the property of the Æolian Company, and shall be appropriated to establish and extend the business of conveyance and of agriculture upon this principle, and of constructing engines for mills, mines, manufactories, &c. upon such terms as shall be agreed and determined upon by a general meeting of the subscribers.

three first chosen, or any other three that may chuse to resign.

ARTICLE VIII.

An application shall be made to parliament in due time, either for a further extension of the patents, or for an exclusive charter, to confirm to the company the possession of all profits arising from the business for ever.

ARTICLE IX.

Instalments not being paid within one month after due notice from the directors being given, the money paid for such share or shares shall be forfeited to the company, and the shares resold.

Subscriptions are received by Messrs.

and by the Inventor and Patentee, No. 1, *Denmark Street, Soho, where the patents, drawings, specifications, and particulars may be seen.*

A NEW SYSTEM

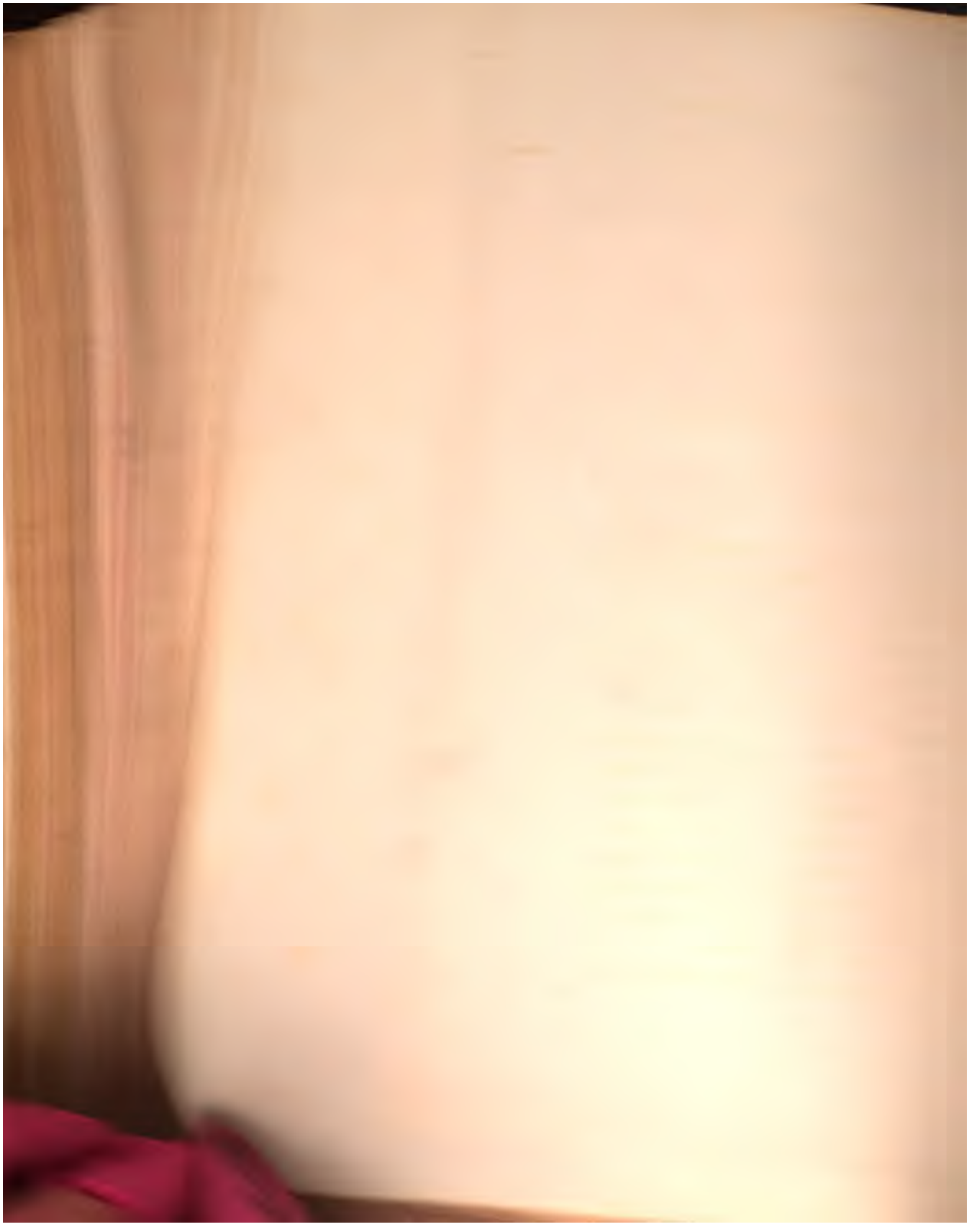
OF

INLAND CONVEYANCE.

A NEW SYSTEM

OF

INLAND CONVEYANCE.



A

NEW SYSTEM

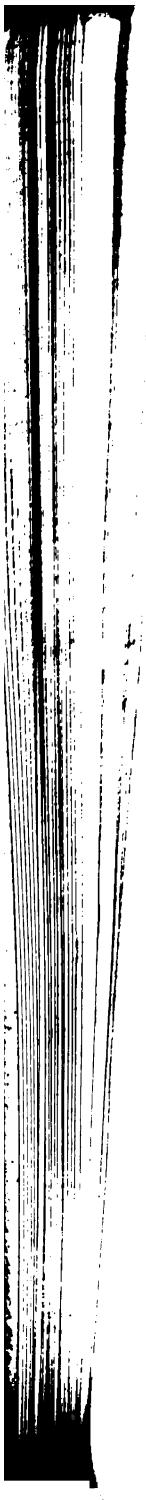
OF

INLAND CONVEYANCE.

ERE is no art that has ever engaged the assi-
y and energy of mankind, that is of such
eral utility, of such immediate and unbounded
ortance, of such innate and intrinsic value to
civilized world, as that of the conveyance of
ls and persons from place to place, over the
ace of the globe.

t is not only of itself of the highest value, but
reates and constitutes, in a very great degree,
value of all other things; for a great part of
natural produce of the whole earth is value-
to mankind for want of the means of convey-
e, and the greatest part of the artificial produce
aluable only in proportion to the facility with
ch it can be conveyed to a market.

he immense capital, and innumerable hands,

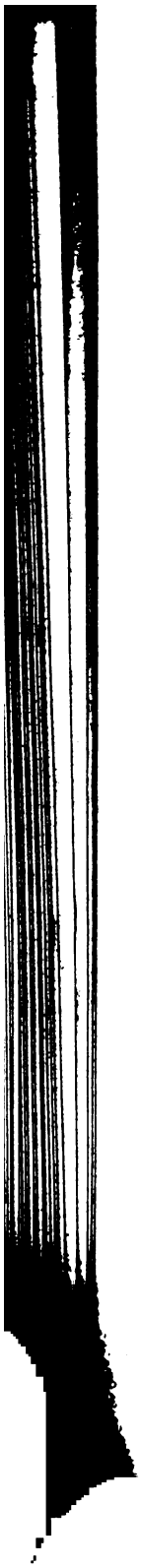


the freedom, the happiness, the science, and the civilization of the whole world.

This new system is founded upon the well-known and wonderful properties of common air—the most powerful and universal mechanical agent within the reach of mankind; created and perpetually maintained by the hand of nature throughout all the regions upon the earth; not withheld from any creature, or from any spot; but is at hand in every climate, from pole to pole, ever ready to exert its utmost force, or to dispense with its own essence, for the service of mankind.

The force of air confined in a tube is well known, and the destruction it produces is often one of the most deplorable circumstances that degrades the image of the Supreme. To extend the civil employment of this powerful guardian and dreadful avenger, of this excellent servant and obedient slave, is a consummation devoutly to be wished; and this essential service it will effectually perform, without exciting any of its fury or resorting to any thing dangerous in the composition, the pressure, or confinement of it; but, by its uniform and steady impulse, it will always be prepared, with perfect subordination, to confer this extensive benefit upon mankind.

In order to apply this principle to the purpose of conveying goods and passengers from place to place, a hollow tube or archway must be constructed the whole distance, of iron, brick, timber,



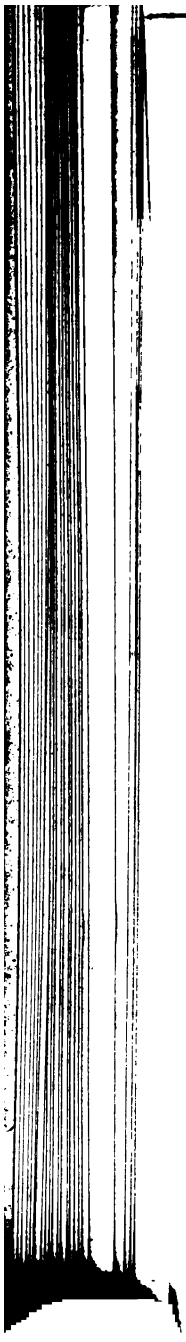
the sides of the canal, the quantity of air that will escape through that opening will not exceed the twenty-fifth part of the whole that is forced in, and which may effectually be compensated by increasing the power of the engine in the same proportion.

It has been found by many experiments, and by an apparatus upon a large scale, made for the purpose, that the force required to drive the air through an aperture of 1 inch square, at the rate of 30 feet in a second (or 20 miles per hour), is 6 drachms per square inch, moving at the same rate. And the force required to drive the air through a tube of 1 inch square, and 56 feet long, at the rate of 30 feet per second, is 20 drachms per inch, moving at the same rate.

Therefore the resistance, by the friction of the air against the sides of the tube, is 14 drachms, moving 30 feet per second, or as fast as the air is moved; and as there are 2,688 superficial inches in the sides of the tube, it amounts to 192 inches per drachm, which is the resistance the air meets with by the friction against the sides of the tube of 1 inch square, in passing through it at the velocity of 30 feet per second.

In tubes of the same form, and of different dimensions, the resistance will be in the proportion that the surface bears to the area.

In a canal of 30 feet area, and 6 feet by 5 in dimension, the proportion of the area to the surface



velocity of 88 feet per second, is 2.75 seconds; and the space it will fall through, in that time, will be 120 feet.

Therefore, the force required to put this body of air in motion, and give it the velocity of 88 feet per second, must be sufficient to raise a weight of 237,980lbs. 120 feet high; and if this is to be done in 20 minutes (the time that the air is to move 20 miles), it will be equal to 545lbs. moved or lifted up 88 feet per second; and this is the *vis inertia* of the body of air, or the force that is requisite to give it the motion of 88 feet per second, acting upon it 20 minutes.

Therefore, as the resistance the air will meet with, by friction, is 305lbs., and the resistance, by the *vis inertia*, is 545lbs., it will require a force of 850lbs., moving 88 feet per second, to keep the air alone in motion, at the rate of 60 miles per hour, in a canal of 30 feet in area, and 20 miles long.

The power required to impel a weight upon a well-made carriage, running upon an even iron road, will be the 60th part of the weight; and therefore a weight of 5 tons, with 10 cwt. for the weight of the carriage, will be impelled by a force of 205lbs., moving at the same rate, viz. 88 feet per second.

From hence it will appear, that the power necessary to convey 5 tons of goods through a canal of 30 feet in area, at the rate of one mile in

air that drives the carriage one way, will prevent any thing from coming the other. And carriages that are going the same way, in the same canal, can never overtake or run foul of each other; for the air that is between them will prevent their approach; and if one, by accident, should be unable to proceed, then the air could not proceed, and those following would be stopped also.

Any irregularity would be instantly shown by the impelling engine, which would be retarded or stopped by any impediment in the way, although it may be many miles distant; and in any part of the line, a barometer, communicating with the internal air, would instantly indicate any change that takes place in the density of it.

The impulse necessary to drive 5 tons of goods, upon a level road of iron, is 205lbs., the 60th part of the weight; and, if the carriage was placed upon a declivity of 1 foot in 60, it would descend by its own weight; consequently, if it is to ascend 1 foot in 60, the impelling power must be doubled (or made equal to 410lbs.), and the whole impulse or labour of the engine would be increased to 1,260lbs. (or about one-fifth more).

But, in going up hill, it is only the goods that will require a greater impulse, and not the air, for that is borne upon its own wings, and floats in its own element, and will as easily move upwards as downwards.

The quantity of air that is necessary to be driven

All turnings in the canal should be avoided as much as possible; and, if unavoidable, should be made in the largest circle that can be admitted.

If the fore axle of the carriage makes an angle of 15 minutes with the hind axle, and the axles are 10 feet apart, it will cause the carriage to turn a quarter of a circle in going 1760 feet, which will be abundantly sufficient for any deviation from a straight line that need to be made in the canal; and this requires the fore axle to be moved only one-fiftieth part of an inch to make an angle of 15 minutes of a degree.

The canal might be built of brick or of timber, and may be lighted withinside by a very narrow slip of glass, to run all along the top of the canal, and guarded by a slip of wire-work. A canal of 30 feet in area, and of 26 feet exterior dimensions, will be 137,280 feet in a mile. If built of brick, of one brick and a half in thickness, the cost will be £.10 per square rod, or £.5,420 per mile.

A cast-iron road, consisting of two parallel lines of iron, of the weight of 10lbs. per foot in length, will weigh 48 tons per mile, which, at £.16 per ton, will be £.768; laying down, £.232; and the glazing iron frame and wire-work £.1,000, making a total of £.7,420 per mile. A steam engine, of 185-horse power, with the machinery necessary to force the air into or out of the canal, will cost £.20,000; and one being placed at each 20 miles distance upon the road, will amount to £.1,000 per mile, making

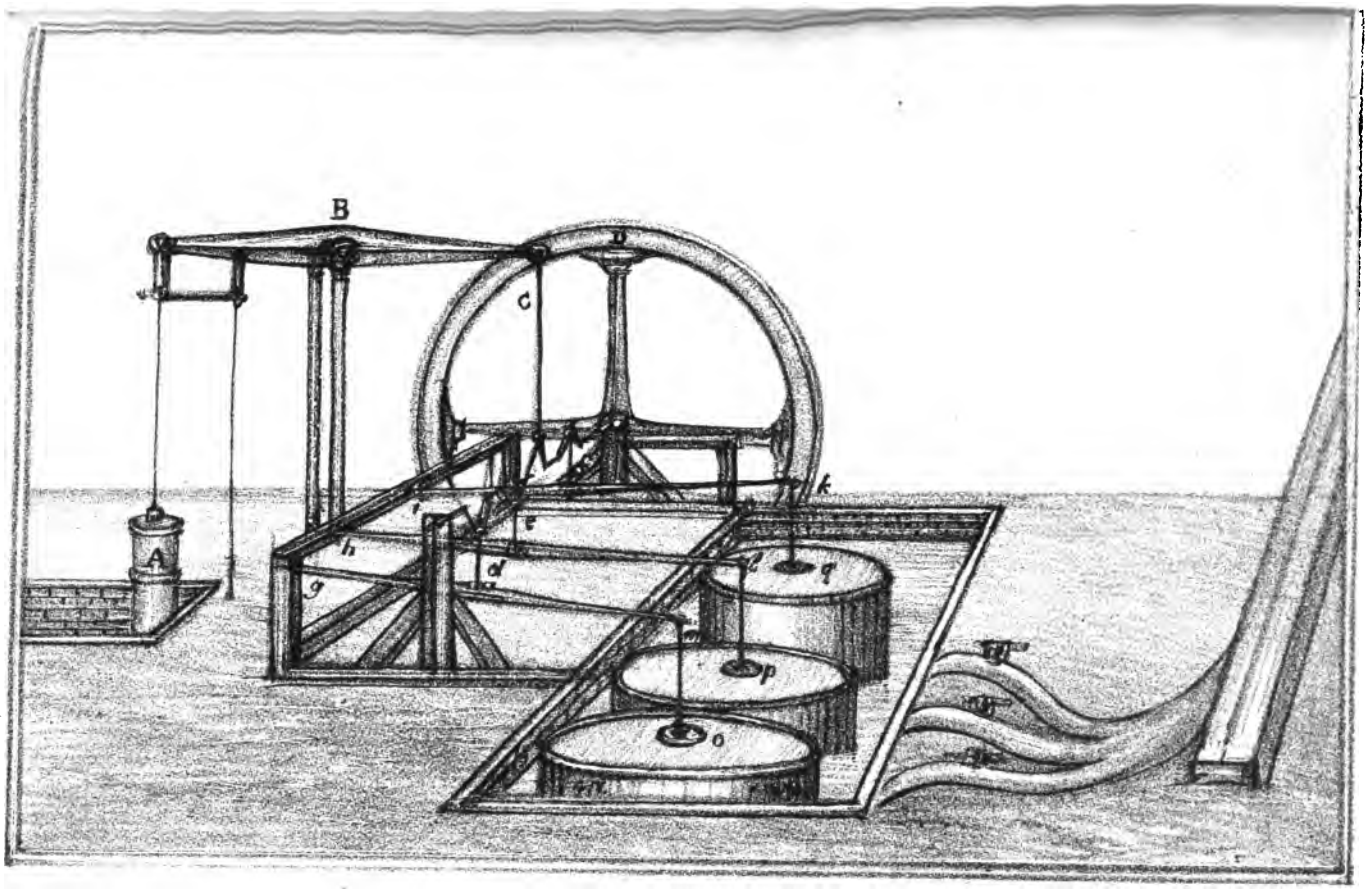
out of the canal, it meets with the outward air, which immediately presents a resistance, while under that velocity, equal to 5 cwt.; and this resistance, gradually diminishing, would stop it in passing upon a level for the space of 550 feet.

Hence, the carriage may be made to rise just as much as is required or convenient, according to the situation of the place, by placing the elevation nearer or farther from the end of the canal. If it rises 10 feet perpendicularly, it will be sufficiently elevated to pass down, by its own weight, into the mouth of the succeeding canal, to continue its journey.

A steam engine, for this purpose, must have a cylinder 30 inches in diameter; and must make 30 ten-feet strokes per minute, working a fly wheel with a treble crank, each crank working a pump containing 1,760 cubic feet of air, which pump must be 14 feet in diameter and 12 feet deep, and the three pumps will throw a continual stream of air into the canal amounting to 2,640 feet per second.

These pumps should be made of wood, open at bottom, and bound with hoops, like a vat; and should be plunged up and down in a bason of water, by which means they would not require a piston, would work without friction and without grease, would lose none of their contents, and would remain perfect as long as the material would endure.

In some situations a fall of water may be


B
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The quantity of interior surface in this tube is 904 square inches per foot in length, 4,777,344 per mile, and 47,773,440 in 10 miles. The proportion of the surface to the area is as 1 to 5.5; and, compared with a tube of one inch in area, it will be as 1 to 22. Therefore, the resistance, by friction, which the air will meet with, moving 30 feet per second, through a tube of these dimensions, and 10 miles long, will be equal to 42lbs. moving with the same velocity.

The quantity of air contained in a tube of this diameter, each foot in length, is 4,976 cubic inches; in one mile, 15,204 feet; and, in 10 miles, 152,040 cubic feet.

The weight of this air is 11,421lbs. (5 tons, 2 cwt.) This weight will give itself the velocity of 30 feet per second, in one second; and, therefore, the 1800th part of the weight, viz. 6lbs. 5oz., acting upon it 1800 seconds (or 30 minutes), and moving 30 feet per second, will produce the same effect, and will be equal to the *vis inertia* of 5 tons, 2 cwt. moving 30 feet per second.

A carriage, loaded with 12 persons, and of the weight altogether of 2,000lbs, will be impelled, upon a level iron road, by a force of 33lbs.; and, therefore, the force required to impel the air through a tube 24 inches in diameter, and 10 miles long, at the rate of 20 miles per hour, with a carriage carrying 12 persons, will be equal to 82lbs. moving 30 feet per second; and the pressure

against the inside carriage, or box, will be 3oz. 2 drachms per square inch, equal to the pressure of 5.4 inches high of water, which is equal to the mechanical power of 5 horses; and will be maintained by 112lbs. of coals for 3 hours and 30 minutes.

The weight of the tube being 314 tons per mile, at £.12 per ton, will be £.3,768 per mile. If the iron road, and the laying down, be £.1,600 per mile, the whole preparation will amount to £.5,368 per mile.

In consequence of its lying in a channel of water, it must, of course, lie level; and cannot be made to rise or fall gradually, as the canal will. But it may be made to ascend at intervals, without stopping; for, if the tube was made to raise up into another level, of not more than 10 or 12 feet higher, the carriage would ascend, and follow it up an inclining plane, by the force of its own velocity, rising over the height, and then sinking down into the channel, it would go on, in the higher level, as before.

But the greatest objection to this mode, and of the dimensions, is, that it is exposed to the wind, which would not only vary its velocity, but, the power being so feeble, it would entirely stop it, when any strength of wind was against it; while the carriage within the aërial canal cannot be affected by the winds nor the weather, by the frost nor the snow, but might continue its course, under all the vicissitudes of nature, from one end

made to shut down close, and air-tight, upon a cast-iron rail laid firmly down upon the other side wall.

In order to make the plate shut down air-tight upon the cast-iron rail, without being riveted to it, there should be a groove all along, upon the top and inner edge of the cast-iron rail, and a thin edge of iron riveted to the plates all along, to fall into the groove; then, if the groove is partially filled with some soft and yielding substance, as cork, wood, leather, hemp, &c. the thin iron edge will bed itself into it, and shut so close that the air will not escape, with so light a pressure as 1 pound per square inch.

The plate that is to form the top of the canal, being thus prepared, may be lifted up out of the groove two or three inches high, in any particular place of the side that is not riveted; and, when let down again, the edge will fall into the groove, by the spring and weight of the plate, and stop close as before.

Therefore, if there is a large and light iron wheel fixed in the front of the interior carriage, and close to the side wall on which the plate shuts into the groove; and if this wheel is planted to stand two inches higher than the under side of the covering plate, this wheel, as it passes along, will constantly lift up the plates, and make an opening of two inches wide, or more, and 8 or 10 feet long; and, when the wheel has passed, the plate will fall down into the groove, and close the joint, as before.

to various purposes and relative to various parts of this system, are omitted, that my work might not exceed the limits I had prescribed.

FIG. 4 is a section of the inside of the canal *a, a, a, a;* and the iron top *b, b,* with the cast-iron plate on the top of the wall *c, c,* and *a, d,* with the groove *a,* and the edge of the plate shutting into it, *n, n,* represents a section of the lifting wheel that is to project above the plate, and to lift it up as it rolls along under it, to admit the iron arm *m, m,* from the carriage, to pass through into the open air, to draw the outside carriage. The dotted line represents the top plate as lifted up.

When the carriage is turned, to go the other way, the lifting wheel *n, n,* and iron arm *m, m,* must be shifted to the other side of the carrriage at *a, c,* that they may be on the opening side of the top.

The iron plate, on the top of the canal, will weigh 4lbs. per square foot, and 20lbs. every foot in length; this, with the labour of riveting together, and to the side, with the two side plates of cast iron, will cost £.1 per foot in length, or £.5,280 per mile.

The two sides of the canal, of 6 feet high each, and the bottom of 7 feet, will be 19 feet of brick-work each foot in length; 100,320 feet in a mile, equal to 368 rods; which, at £.10 per rod, is £.3,680 per mile.

The two iron roads, one within and one without the canal, £.2,000 per mile; the engine, £.1,000;

ame or box, within the tube, should be
feet long, and must be guided by wheels,
des, as large as can be admitted, and as
med and planted as possible; the number
fourteen or sixteen.

iston, or vane, must be formed near the
of the frame, to intercept the air, and must
thered all round, so as lightly or barely to
the sides of the tube.

.e inside, or middle of this vane, should be
, and the opening filled up and closed by a
e, suspended by an axis across the middle of
opening, so that this valve, by turning on its
s, may open the vane, and suffer the air to
ss through, and prevent its impulse upon the
ne and carriage, or, by closing the valve, inter-
ept the air, and give it motion.

By this means, the conductor of the carriage may restrain and limit the velocity, and stop the carriage, at any time and at any place, by a communication from the valve, through the opening, to the conductor on the outside; and this will be done without the least violence, shock, or chance of disordering any thing, either within or without.

FIG. 5 represents the vane within its frame *m, m, m, m;* the outside edge of the vane, *a, b, c, d,* is leathered all round, and the middle part, *o, p, q, r,* is open, and is to be closed by the double valve, that is to turn upon its vertical axis *e, e.* The valve will shut, half on one side of the vane *a, b, c, d,* and half on the other; when it is shut,

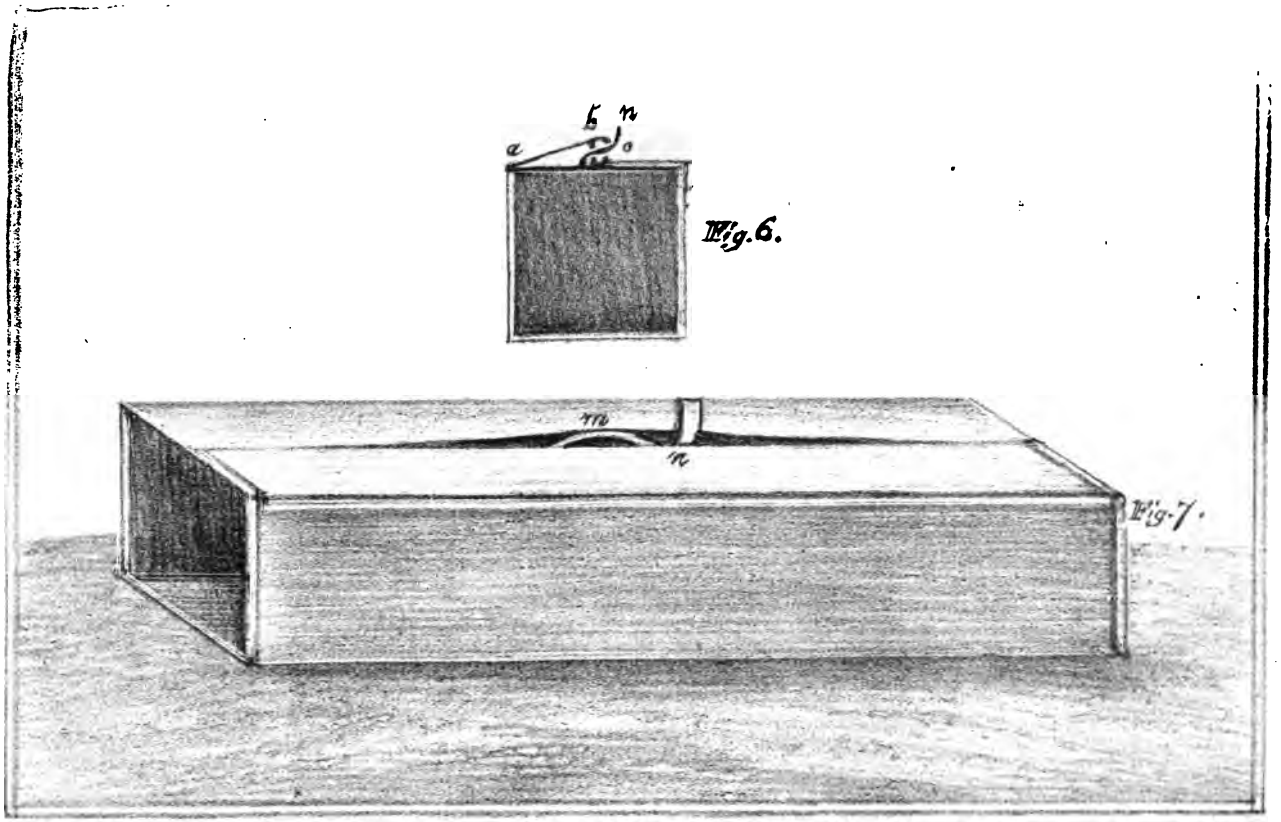


Fig. 6.

Fig. 7.

If the weight of the carriage and load is 6,000lbs., the resistance it will receive upon a common road, by the friction of the wheels, will be a 30th part of the weight; it will, therefore, be 200lbs., moving 88 feet per second. And if the road rises 1 foot in 30, or 176 feet in a mile, the force must be double, *viz.* 400lbs.

The surface presented by the front of the carriage to the air, as it passes through it, cannot be less than 15 square feet; and the carriage going at the rate of 60 miles per hour, the still air will present a continual resistance of 260lbs.

From these calculations it will appear, that the force necessary to convey 5 tons of goods 60 miles per hour, upon a common road, will be as follows:—

	lbs.
Resistance by the friction of the tube	302
Resistance by the *vis inertia* of the air ...	77
Resistance by the wheels of the carriage	400
Resistance by the ambient air	260

which amounts to 1,039lbs. moving 88 feet per second, or 1lb. 13oz. pressure per inch upon the vane, which is equal to the power of 182 horses, and will be maintained by steam engines 20 miles apart, and by the consumption of 6 cwt. of coals per hour, which, according to the price of coals in London, does not amount to two farthings per ton per mile!!!

A cast-iron square tube, of 4 feet in the area, with one half of the top open, with the flanches on

view, or even the hopes, of the most sanguine, upon any principle that has hitherto engaged the attention of mankind.

In the year 1810, I published a short account of this invention, entitled, "*A New Method of conveying Letters and Goods by Air*;" and, two years afterwards, I published some calculations and remarks tending to prove the practicability of the scheme.

These publications met with that indifference and contempt, which usually attend all attempts to deviate so widely from established customs; for it is the fate of every one who dares to wander out of the beaten path, in search of fame or fortune, to encounter innumerable obstacles thrown in his way, by the habits, the prejudices, and the interests of mankind; if he is unsuccessful in his pursuits, ridicule and ruin are always ready to present themselves, to aggravate his misfortune. If truth and science should declare in his favour, they are of such feeble influence, that envy and interest eagerly combine to snatch from his trembling hand the sapless sprig of fading laurel, which the apathy of the world reluctantly bestows upon his labour.

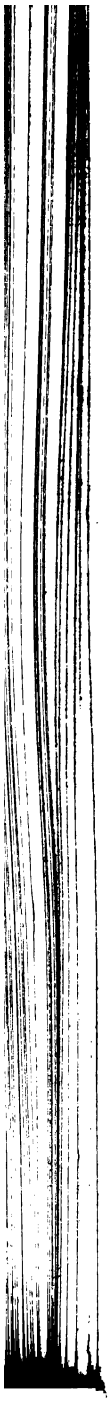
Such are the views of an ardent mind, to give wings to the commerce of the world, from shore to shore; and no one can say how far it is possible to create new principles of power, and invent new modes of application, that may open a boundless scene, and an inexhaustible source of improvement

capable of going upon the common road from 5 to 7 miles per hour; one of them is capable of carrying 4 persons, and both are driven entirely by steam.

The first of these was made in the year 1819, and tried with success, in the New Road, between Paddington and Islington, on the 3rd of April, 1820, and again on the 6th of July, the same year; it was, at that time, made chiefly of tin, but was afterwards renewed, and made of copper, and exhibited in the same road, on the 3rd of May, 1821, and again on the 12th of June, in the same year, when it must have been seen, by some hundreds of people, passing through the streets into the road, through the turnpike gates, and up and down Paddington Hill, at the rate of 5 miles per hour, carrying one person, and its own fire, water, and fuel. The same carriage was again exhibited, on the same ground, in a more perfect state, on the 29th of June, 1821.

Another engine and carriage was then put in hand, upon an enlarged scale, and more perfect and substantial machinery; they are both now in a finished state, and ready for sale. The last will carry 4 persons, at the rate of 7 miles per hour, with its own fuel and water for one hour, with which it feeds itself continually.

The progress of this scheme has been delayed for some years by a most severe family affliction; and, finally, a heavy and irreparable loss. It will be resumed, and shortly exhibited in a state of



A CATALOGUE AND DESCRIPTION

OF THE VARIOUS

Forms, Sizes, Strength, Capacity, Prices, and General Utility,

OF THE

PATENT SCALES,

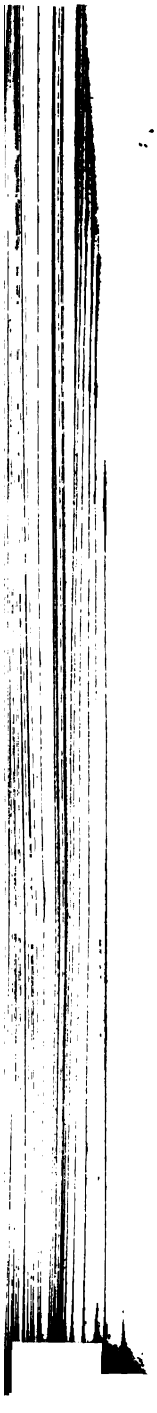
MADE AND SOLD BY THE INVENTOR AND PATENTEE,

G. MEDHURST,

Iron Founder and Engineer,

DENMARK STREET, SOHO, LONDON.

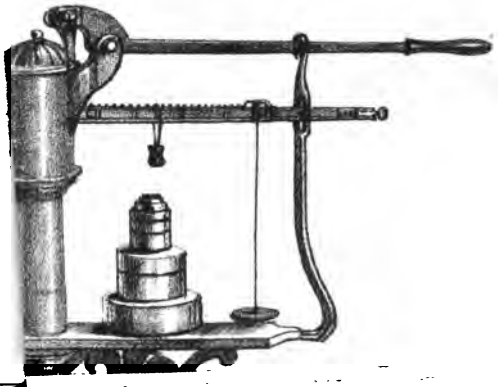
No.		£.	s.	d.
1.	COUNTER Scales, on a pillar frame, 6 inches high, to weigh 7lb. and under; designed for the use of Bakers, Grocers, Confectioners, Chemists, &c.	2	0	0
2.	Counter Scales, to weigh 28lb. and under, suitable and generally adopted in retail trade and private families	3	0	0
3.	Inverted Scales, of the same size, having the plates at the bottom of the frame	3	0	0
4.	Counter Scales, to weigh 56lb. and under, for Tea, Grocery, Candles, and all Kinds of Goods weighed upon the Counter	3	10	0
5.	Inverted Scales, of the same size and strength . . .	4	0	0
6.	Counter Scales, to weigh 100lb. and under, exceedingly convenient and useful in Inns, Taverns, Schools, and Families	4	10	0
7.	Inverted Scales, of the same capacity	5	0	0
8.	Table Scales, 2-feet 6-inches high, capable of weighing 2 cwt. portable, compact, permanent, and accurate, and of inestimable value in Inns, Taverns, Schools, Hospitals, Public Charities, and large Families . .	5	0	0
9.	Table Scales, of the same capacity, on a pillar frame of iron, compact, firm, and steady, and the works well protected from dust and accidental injury	5	0	0
10.	Single Scales, for weighing Corn, Flour, Seed, Fruit, &c. universally used, and indispensably requisite, in the Corn and Flour Trade	5	0	0
11.	The same, with wheels and handles to move it without injury;—either of these, besides their general utility in trade, will be found of incalculable value, and are strongly recommended to the Governors of every Parochial and Benevolent Establishment in the Kingdom .	6	0	0
12.	Single Scales, on an iron pillar frame, well protected from obstruction or accidents	6	0	0

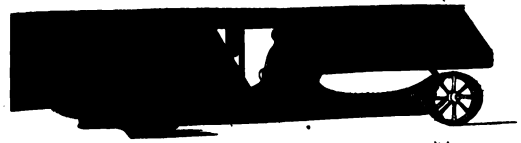


No.		£.	s.	d.
28.	**Tanners' Scales**, made entirely of iron, with all the appurtenants, and every advantage appertaining to the materials	20	0	0
29.	**Inverted Scales**, the largest size, made entirely of iron, plates 30 inches square, capable of weighing 20 cwt. and adapted to weigh Sugars, Spirits, Bales, Cases, Coal, Ore, &c.	20	0	0
30.	**Treble Scales**, only 6 inches high, made entirely of iron, with plates 2 feet square, furnished with wheels and handles, and capable of weighing 10 cwt.;—This contrivance is truly original, simple, correct, and effectual, possessing the most desirable accommodations; strong, but not heavy; capacious, but not cumbersome; commodious, but not complex; and well made, but not expensive	14	0	0
31.	**Treble Scales**, second size, 8 inches high, made of iron, with wheels and handles; and with plates 30 inches square, adapted to weigh, with the utmost facility, Sugar, Spirits, Oil, Tallow, &c., and for the East and West India trade	22	0	0
32.	**Treble Scales**, third size, 8 inches high, made of iron, with wheels and handles; and with plates 3 feet square, capable of weighing 30 cwt. and exceedingly convenient for wharf and crane work, as there is no obstruction to the goods, and no striking of the weights to unload	28	0	0
33.	**Treble Scales**, fourth size, made of iron, on wheels, movable by a horse, with plates 4 feet square, and capable of weighing 2 tons	40	0	0
34.	**Treble Scales**, fifth size, made of iron, with plates 5 feet square, capable of weighing the most unwieldly and cumbersome goods, with safety, expedition, and accuracy	60	0	0
35.	**Proportional Scales**, constructed to weigh Flour, Corn, &c. with small weights, and which is effected with greater ease and facility than by any other mode whatever; they occupy very little room, are substantial, durable, and accurate.—*Price with Weights* . . .	6	0	0
36.	**Proportional Scales**, comprised in a box or drawer, of small dimensions, and capable of weighing a sack of Flour, Corn, or Potatoes, with 20lb. of weights, and any smaller weight in proportion.—*Price with Weights*	8	0	0
37.	**Proportional Scales**, on wheels, made entirely of iron, and capable of weighing 10 cwt. by 50lb. of weights—*With Weights complete*	12	0	0
38.	**Proportional Scales** on wheels, made entirely of iron, with a plate 30 inches square, capable of weighing 20 cwt. with 100lb. of weight	25	0	0
39.	**Proportional Scales**, made of iron, and adapted to weigh Cattle by a single weight and graduated beam, so constructed as to ascertain at sight every pound from 1 to 5000, with 360 divisions only, and this with facility, ease, and certainty	40	0	0

) RM WEIGHING

PL.4





Weigh Bridge is made upon the best principles for Heavy Goods Live Cattle & Road Waggons

Cast Iron Weights of all kinds round and square adjusted to any standard required

The Patent Scales are used in the same manner as the common Scales the Weights are put on one board and the Goods upon the other & the Weights are the same in all respects as those in common use

A PATENT CANAL LOCK,

DESIGNED TO PREVENT

The Loss of Water in passing Boats from one Level to another;

INVENTED BY G. MEDHURST,

Iron Founder and Engineer,

DENMARK STREET, SOHO, LONDON.

THIS Invention preserves the usual form, dimension, strength, and safety of the best constructed Locks at present in use.

The Water is raised up in the Lock to the higher level, from a source quite independent of the Canal Water, or sunk down to the lower level by returning the water from whence it came, without losing the smallest quantity; thereby accomplishing the great object so long and so ardently sought for, and so necessary to the perfection of Canal Navigation.

The Water and Vessel in the Lock, when in action, constitutes a variable pressure and burthen; but it is always, and in all situations, perfectly balanced by an equal column of water: it is therefore put in motion by the smallest mechanical force; and the management of it is completely within the power of one man, to pass a Vessel either way in the usual time.

The Invention possesses, in a very high degree, the inestimable excellence of simplicity. The Apparatus is so completely divested of all machinery, of all complex and precise arrangements, uncertain operation, or difficult execution, that it cannot be misapplied, or in danger of accidents by mismanagement; will not be liable to injury by frost, flood, or drought; and will continue unimpaired, and effectual, so long as the materials endure.

The Apparatus is also capable of being applied to any number of Locks that are contiguous, or at a short distance from each other, whatever their difference of elevation, and as effectually as to one only.

A complete Model may be seen at the Manufactory.

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